

Chapter 1: Introduction to the 2009 South Florida Environmental Report – Volume I

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This introductory chapter highlights the governmental, scientific, and legal context behind the *2009 South Florida Environmental Report* (SFER). The SFER — a sweeping consolidation of South Florida Water Management District (District or SFWMD) and Florida Department of Environmental Protection (FDEP) reporting — is essential to support sound, long-term environmental management decisions by the District, the FDEP, and other agencies. The 2009 SFER continues to efficiently unify more than 50 individual reports into a single document, pursuant to Chapter 2005-36, Laws of Florida, and Subsection 373.036(7), Florida Statutes (F.S.) While continuing to provide efficient communication and production, the annual SFER covers the past year's major results and findings, as well as current and projected financial information for those chapters that have specific fiscal reporting requirements. Overall, the information presented in the SFER aids in the implementation of Everglades restoration activities and supports the restoration, management, and protection activities associated with Lake Okeechobee, the Kissimmee Basin, and South Florida's coastal ecosystems.

The *2009 South Florida Environment Report* includes the two-volume main report and the Executive Summary. In 13 chapters, *Volume I, The South Florida Environment*, provides data summaries for all major ecosystems in South Florida during Water Year 2008 (WY2008) (May 1, 2007–April 30, 2008) and highlights the District's financial resources management during Fiscal Year 2008 (FY2008) (October 1, 2007–September 30, 2008). Similar to previous SFERs, this year's Volume I continues the overall objective to summarize available data and findings associated with South Florida restoration activities. These chapters are also supported and enhanced by appended documentation that provides data summaries and detailed analyses for the special-interest reader and complies with various permit requirements.

Volume II, District Annual Plans and Reports, summarizes the FY2008 planning and project status for eight annual reports required under various mandates. Required of all five water management districts in Florida, these reports include the Annual Work Plan Report, Minimum Flows and Levels Priority List and Schedule, Five-Year Capital Improvements Plan, Five-Year Water Resource Development Work Program, Alternative Water Supply Annual Report, Florida Forever Work Plan Annual Update, Land Stewardship Annual Report, and Mitigation Donation Annual Report.

¹ *Content of the 2009 South Florida Environmental Report – Volume I* section

² *Update on Reengineering Water Quality Monitoring in South Florida* section

The *2009 South Florida Environmental Report, Executive Summary*, is written for a diverse readership and provides an abstract of both volumes of the main report's key facts and supporting information. The summary was developed to highlight key findings to stakeholders and decision makers, particularly regarding regional programs and projects across the District. Continuing with the SFER Executive Summary's theme of conveying the many distinctive areas throughout the South Florida environment, this year's cover will feature the Everglades, also known as the *River of Grass*.

In addition to describing the setting of the SFER, this chapter outlines the rest of the content in Volume I. Specifically, the geographic features of the South Florida environment, related District programs, and the comprehensive restoration efforts throughout South Florida are briefly described. The Volume I objectives, including a summary of the numerous legal and reporting requirements and the processes used to create the 2009 report and related peer and public review, are also presented. Lastly, an update on the District's reengineering of water quality monitoring in South Florida — introduced in the 2008 SFER – Volume I, Chapter 1B — is provided at the end of this chapter. The first chapter of this year's SFER Volume II contains a volume-focused introduction similar to this one.

An overview of the 2009 SFER peer-review process is presented in Appendix 1-1. During this process, the public and panel review resulted in many written comments and suggestions to the report's authors. Comments from the peer-review panel on the draft 2009 SFER, as posted on the SFER WebBoard, are provided in Appendix 1-2. Public comments posted to this WebBoard are provided in Appendix 1-3. The authors' responses to these initial comments are provided in Appendix 1-4. Appendix 1-5 contains the 2009 panel's final report, reproduced verbatim, and the authors' responses to these final panel comments and recommendations are presented in Appendix 1-6. Advice from the SFER panel and from other reviewers provided guidance to the Volume I authors through revisions while preparing the final 2009 report.

THE SOUTH FLORIDA ENVIRONMENT

MAJOR GEOGRAPHIC FEATURES

South Florida is characterized by its unique, diverse ecosystems from the Kissimmee Region in the north through the Florida Keys in the south. The major features of the South Florida environment within the District's boundaries are depicted in **Figure 1-1** and summarized on **Table 1-1**. As a product of District-wide initiatives to better manage and report on the many programs and projects throughout South Florida, the region is now categorized into two primary sub-regions — the Northern and Southern Everglades. As depicted on **Figure 1-1**, the Northern and Southern Everglades are delineated across regional watershed boundaries, with the Northern Everglades covering the Kissimmee, Lake Okeechobee, Caloosahatchee, and St. Lucie watersheds, and the Southern Everglades encompassing the watersheds south of Lake Okeechobee through the Florida Keys. The main features in the Northern Everglades include Kissimmee area lakes and rivers, Lake Okeechobee, and the Caloosahatchee and St. Lucie rivers and estuaries. Key features in the Southern Everglades include the Water Conservation Areas, Big Cypress National Preserve, Everglades National Park/Florida Bay, and coastal bays and estuaries south of Lake Okeechobee.

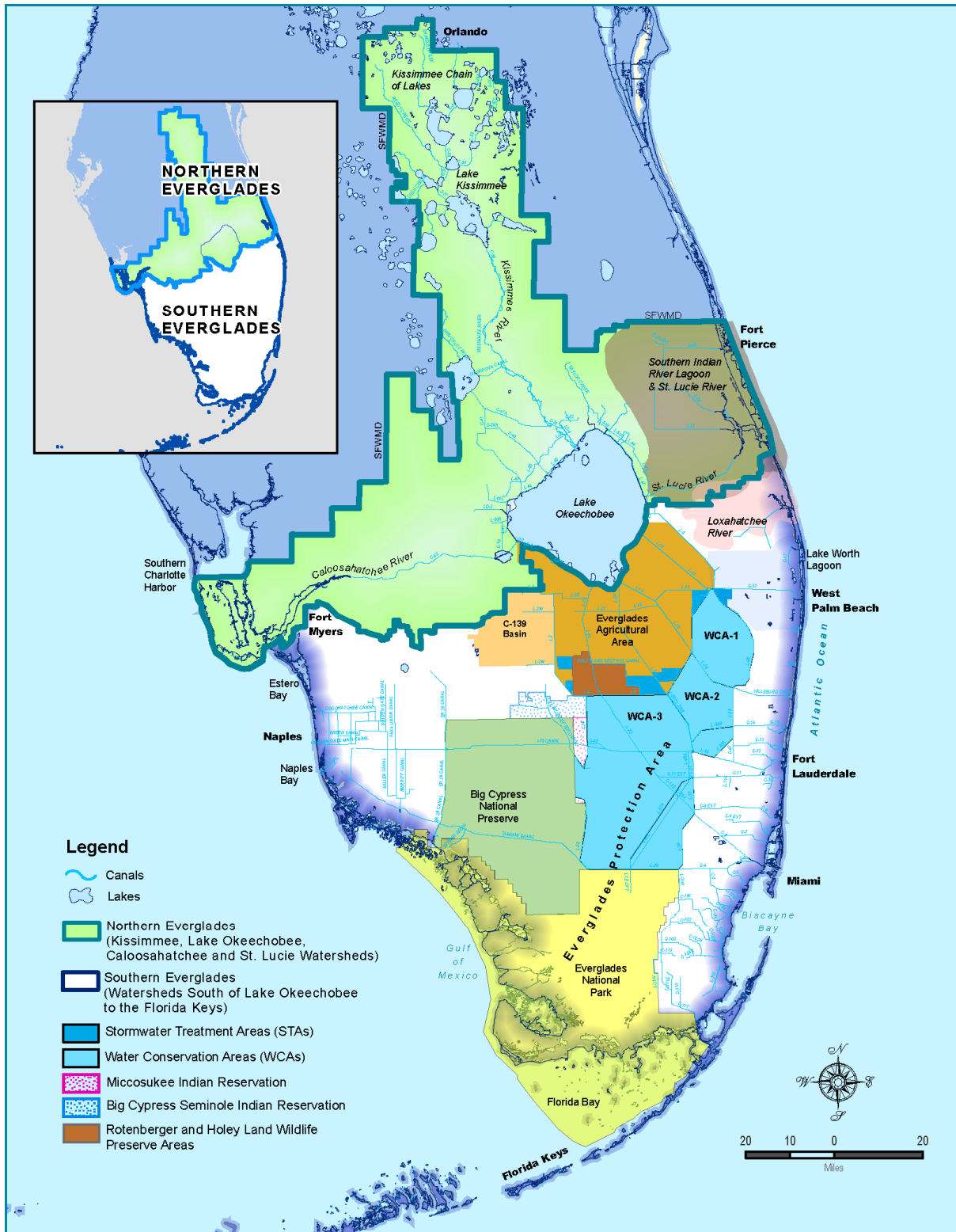


Figure 1-1. Major geographic features of the South Florida environment within the District’s boundaries. [See also Figure 2-1 of this volume for major hydrological features in South Florida.]

Table 1-1. Major features of the South Florida environment within District boundaries.

<u>Geographic Area</u>	<u>Area</u>		<u>Description</u>
	(square kilometers)	(square miles)	
<u>Everglades Region</u>			
Everglades Protection Area (EPA)	9,000	3,474	Comprised of Water Conservation Areas 1, 2A, 2B, 3A, and 3B; Arthur R. Marshall Loxahatchee National Wildlife Refuge; and Everglades National Park
Water Conservation Area 1 (WCA-1)	566	218	Within the Refuge, which is slightly larger, but almost geographically synonymous with WCA-1; managed by USFWS, SFWMD, and USACE; sawgrass wetland with many tree islands; receives water primarily from STA-1W, STA-1E, and EAA region
Water Conservation Area 2 (WCA-2)	537	207	Managed by the District with USACE and FWC; smallest WCA divided into WCA-2A and 2B; sawgrass wetland with tree islands; receives water primarily from STA-2, STA-3/4, WCA-1, and EAA region
Water Conservation Area 3 (WCA-3)	2,339	903	Managed by the District with USACE and FWC; largest WCA divided into WCA-3A and 3B; sawgrass marsh with tree islands, wet prairies, and sloughs; receives water primarily from STA-5, STA-6, WCA-2, Big Cypress National Preserve, and EAA region
Everglades National Park (ENP)	6,107	2,358	Second-largest national park and one of the nation's 10 most endangered parks; established in 1934 to preserve the unique Everglades ecology; managed by USFWS and National Park Service with USACE and SFWMD; freshwater sloughs, marl-forming marshes, and mangroves
Everglades Agricultural Area (EAA)	2,872	1,109	Highly productive agricultural land containing rich, organic peat or muck soils; 77 percent is in agricultural production; recognized as a major contributor to nutrient enrichment of the region; basin is the subject of a water quality monitoring program and a regulatory Best Management Practices program
Holey Land Wildlife Management Area	140	54	Managed by FWC; lies within EAA boundaries; heavily used for deer and hog hunting; important for game management, water resource protection, and providing habitat corridors adjacent to the EPA
Rotenberger Wildlife Management Area	96	37	Managed by FWC; lies within EAA boundaries; heavily used for deer and hog hunting; important for game management, water resource protection, and providing habitat corridors adjacent to the EPA
C-139 Basin	686	265	Agriculture is the dominant land use; discharges into WCA-3A via structures; basin is the subject of a water quality monitoring program and a regulatory Best Management Practices program
Big Cypress National Preserve	2,280	880	Established in 1974 to protect natural and recreational values of the Big Cypress Watershed; land supports hunting, fishing, and oil and gas production; provides an ecological buffer zone and water supply for Everglades National Park

Table 1-1. Continued.

<u>Geographic Area</u>	<u>Area</u>		<u>Description</u>
	(square kilometers)	(square miles)	
<u>Lake Okeechobee</u>	1,803	696	Large, shallow eutrophic lake and largest body of fresh water in the southeastern U.S.; managed by the District with USACE and FWC; watershed covers about 3.5 million acres, or 10,400 square kilometers; provides water supply, flood protection, sport and commercial fishery, and wetland habitat; functions as the central part of a large interconnected aquatic ecosystem in South Florida and is the major surface water body of the Central and Southern Florida Flood Control Project
<u>Kissimmee Basin</u>	6,200	2,393	Managed by District with USACE and FWC; watershed forms the headwaters to the greater Kissimmee-Okeechobee-Everglades ecosystem and includes the drainage area of Lake Istokpoga, the Kissimmee River and the Upper Kissimmee Basin; the Upper Kissimmee Basin is an important regional water source and diverse natural resource that transitions between warm, temperate and subtropical areas; the Lower Kissimmee Basin includes the historic Kissimmee River and its tributary watersheds between Lake Kissimmee, Lake Okeechobee, and the C-38 flood control canal; Kissimmee Chain of Lakes consists of 28 prominent lakes that function hydrologically and ecologically as a regional-scale system, resides within 14 sub-watersheds and is fed by more than 30 tributaries throughout the region
Upper Kissimmee Basin	4,200	1,621	
Lower Kissimmee Basin	2,000	772	
<u>Coastal Ecosystems</u>			
Southern Indian River Lagoon	860	332	Designated for special study, protection, and restoration as part of the regional National Estuary Programs; characterized by the greatest species diversity of any estuary in North America; supports fishing, clamming, ecotourism, agriculture, and recreation
St. Lucie River and Estuary	24	9	Part of the Indian River Lagoon estuary system and drained by several creeks and canals that flow into the North or South Fork of the St. Lucie River before entering the lagoon near the St. Lucie Inlet; provides habitat for thousands of plant and animal species and supports commercial, recreational, and educational activities
Loxahatchee River and Estuary	15.4	4	First federally designated National Wild and Scenic River; watershed includes the communities of Hobe Sound, Tequesta, Jupiter, Jupiter Inlet Colony, Jupiter Farms, Juno Beach, and Palm Beach Gardens; watershed contains large tracts of undisturbed land, protected parcels, and agricultural land; very diverse habitat includes coastal sand pine scrub, pinelands, xeric oak scrub, hardwood hammock, freshwater marsh, wet prairie, cypress swamps, mangrove swamps, seagrass beds, tidal flats, oyster beds, and coastal dunes

Table 1-1. Continued.

<u>Geographic Area</u>	<u>Area</u>		<u>Description</u>
	(square kilometers)	(square miles)	
<u>Coastal Ecosystems (continued)</u>			
Lake Worth Lagoon	11	30	Watershed is highly urbanized; lagoon was historically a freshwater lake with occasional brackish conditions and converted to a marine environment since the early 1900s
Biscayne Bay	1,100	428	Subtropical estuary designated as an aquatic preserve and Outstanding Florida Water; bay is comprised of north, central, and south regions; contains a coral reef system which is the world's third longest and the only one in the world located in close proximity to a large highly urbanized coastal area; reef is home to more than 200 marine species of fish and is important for fisheries
Florida Bay and Florida Keys	2,200	849	About 80 percent of the bay lies within Everglades National Park; a broad, shallow expanse of brackish-to-salty water that contains numerous small islands, extensive sandbars and grass flats; mangroves and seagrasses provide valuable habitat for many species; Florida Keys watershed consists of a limestone island archipelago of about 800 islands extending southwest for over 320 kilometers, or 200 miles
Estero Bay	39	15	Long, narrow, and very shallow water body; several barrier islands separate the bay from the Gulf of Mexico; the bay has five rookery and roosting islands utilized by thousands of native birds
Caloosahatchee River and Estuary	82	32	Large estuary where the Gulf of Mexico mixes with freshwater inflows from the river, sloughs, and overland sheetflows in the basin; lower reaches of the estuary are characterized by a shallow bay, extensive seagrass beds, and sand flats; extensive mangrove forests dominate undeveloped shoreline areas
Southern Charlotte Harbor	336	130	Florida's second-largest open water estuary and one of the state's major environmental features; designated for special study, protection and restoration as part of the regional National Estuary Programs; area contains three national wildlife refuges and four aquatic preserves

District or SFWMD – South Florida Water Management District
 USACE – U.S. Army Corps of Engineers
 FWC – Florida Fish and Wildlife Conservation Commission

STA – Stormwater Treatment Area
 USFWS – U.S. Fish and Wildlife Service
 WCA – Water Conservation Area

SYSTEMWIDE CHALLENGES AND INITIATIVES

Over the past century, South Florida has dramatically changed because of widespread development and increased urbanization, resulting in huge modifications to the hydrology and chemistry of ecosystems throughout the region. Such changes are evident throughout the entire Kissimmee-Okeechobee-Everglades (KOE) and coastal ecosystems, which have been altered fundamentally by changes in spatial extent, hydrology, water quality, and ecology. The Everglades has been reduced to over half of its original extent, and its water supply has been significantly modified in both quantity and quality. Starting in the 1950s, the natural Kissimmee River and its floodplain were channelized for flood control improvements, causing extensive losses of valuable wetland habitats. Runoff from urban and agricultural lands near Lake Okeechobee pose an ongoing challenge to water management, making it difficult to balance issues related to water supply and prevent impacts to downstream ecosystems. Throughout South Florida, the quality of surface water inflows, particularly for the nutrient phosphorus, is a problem. Also, invasive exotic species are aggressively invading natural habitats and causing displacement of native plants and animals. The far-reaching effects of these issues, along with multifaceted, comprehensive strategies for restoring the KOE and coastal ecosystems, are addressed throughout this volume. An overview of key District programs and initiatives addressing regional management and restoration efforts is presented in **Table 1-2**.

While regional development (with its associated water management system) has altered the local movement and balance of water, it has not removed the interdependence of sub-regions and the overall north-south movement of water in the South Florida landscape. As water moves from the Upper Kissimmee Basin and other parts of the Lake Okeechobee Watershed at the northern edge of the KOE ecosystem through the Kissimmee River (Chapter 11) and other tributaries to the lake (**Figure 1-2**), water comes to reflect surrounding land uses and changes quality before entering Lake Okeechobee (Chapter 10). Like all lakes, the chemistry of Lake Okeechobee reflects the lake's history, and tributary waters are altered greatly as they mix with ambient water in the lake, losing their identity in the process. Water levels in the lake reflect the balance between inflows, rainfall, outflows, and evaporation (Chapter 2) and are a result of a combination of weather and management operations. Water levels are managed through outflow discharges, determined based on a regulation schedule and an operational decision tree. As water levels exceed various thresholds, outflows may be high enough to produce significant impacts on the Caloosahatchee and St. Lucie rivers downstream of the lake (see Chapter 12).

From the liquid heart of the system, Lake Okeechobee, some water moves southward through the Everglades Agricultural Area (EAA) (Chapter 4) and through the Stormwater Treatment Areas (STAs) (Chapter 5). Outflows from the treatment areas and other tributary basins move into the Everglades Protection Area, which contains remnant Everglades marshes providing vital surface water to sustain the natural and human elements of the southern part of the regional ecosystem (Chapter 6). The interconnectedness of this massive system is most obvious during climatic extremes, particularly droughts and floods, when water management must actively control the water balance in various parts of the system. Regional-scale models used widely in the Comprehensive Everglades Restoration Plan (CERP) planning process (Chapter 7A) are able to quantify the cascading influences of water management across the region and demonstrate the systemwide effects of CERP components.

During the reporting period for the *2009 South Florida Environmental Report*, the effects of a multi-year rainfall deficit continued to impact South Florida (see **Figure 1-2**). Following back-to-back years of unprecedented hurricane activity and higher-than-normal rainfall in 2004 and 2005, a water shortage affected the entire region from late 2006 through WY2008. During the 2006–2008 drought, related impacts were quite pronounced in the Lake Okeechobee watershed, as evidenced by record-low water levels and exposed water control structures in the vicinity. It should be noted that prolonged drought continued through late summer 2008, until Tropical Storm Fay brought relief in August 2008.

Emergency water use restrictions have been in place for most of the District's 16-county region since early 2007. Water use restrictions are expected to continue in order to balance longer-term regional water availability and supply needs. The District also is continuing rule development for proposed District-wide year-round landscape irrigation measures, a key component of the District's comprehensive water conservation program for South Florida. On a broader scale, this District program includes regulatory, voluntary, incentive-based, education, and marketing strategies to address water conservation and effect change toward a lasting conservation culture in South Florida. Additional information regarding the regional 2006–2008 drought and its related effects on the regional water management system is presented in Chapters 2 and 10 and throughout other chapters in this volume. Further details are also available on the District's web site at www.sfwmd.gov/conserv.

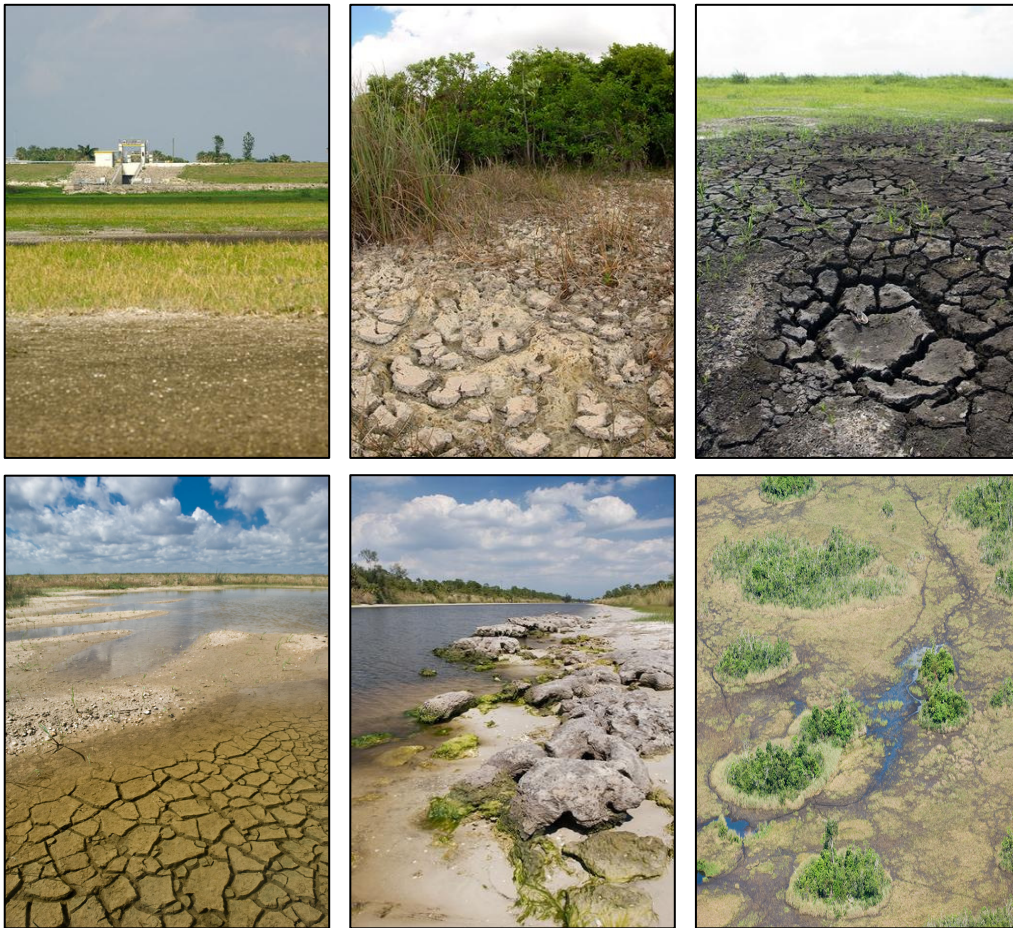


Figure 1-2. Snapshots of widespread drought conditions across the South Florida environment during Water Year 2008 (photos by the SFWMD).

Table 1-2. Key District programs addressing management and restoration efforts in South Florida.

Regional Programs	Key Components
<p><u>Everglades Program</u></p> <p><i>Main 2009 SFER Coverage: Volume I - Chapters 1–9</i></p> <p><i>Key Objective:</i> To restore and protect the Everglades system as a result of adverse changes in water quality and the quantity, distribution and timing of flows</p>	<p>Southern Everglades</p> <p>Everglades Construction Project</p> <p>Stormwater Treatment Areas</p> <p>Phosphorus Source Control Programs</p> <p>Long-Term Plan for Achieving Everglades Water Quality Goals</p> <p>Comprehensive Everglades Restoration Plan (CERP)</p>
<p><u>Lake Okeechobee Watershed Protection Program</u></p> <p><i>Main 2009 SFER Coverage: Volume I - Chapters 9 & 10</i></p> <p><i>Key Objective:</i> To rehabilitate the lake and enhance its ecosystem while maintaining other project purposes, such as water supply and flood control</p>	<p>Northern Everglades</p> <p>Comprehensive Everglades Restoration Plan</p> <p>Lake Okeechobee Construction Project</p> <p>Lake Okeechobee Watershed Phosphorus Control Program</p> <p>Lake Okeechobee Research & Water Quality Monitoring Program</p> <p>Lake Okeechobee Exotic Species Control Program</p> <p>Lake Okeechobee Internal Phosphorus Management Program</p>

Table 1-2. Continued.

Regional Programs	Key Components
<p><u>Kissimmee River Restoration Program</u></p> <p><i>Main 2009 SFER Coverage: Volume I - Chapters 9 & 11</i></p> <p><i>Key Objective:</i> To restore over 40 square miles of river/floodplain ecosystem including 43 miles of meandering river channel and 27,000 acres of wetlands</p>	<p>Northern Everglades</p> <p>Kissimmee River Restoration Project</p> <p>Kissimmee River Restoration Evaluation Program</p> <p>Kissimmee River Headwaters Revitalization Project</p> <p>Kissimmee Chain of Lakes - Long-Term Management Plan</p>
<p><u>Coastal Watersheds Program</u></p> <p><i>Main 2009 SFER Coverage: Volume I - Chapters 9 & 12</i></p> <p><i>Key Objective:</i> To manage freshwater discharge to South Florida's estuaries in a way that preserves, protects, and where possible, restores essential estuarine resources</p>	<p>Various projects and plans for the following areas:</p> <p>Northern Everglades</p> <ul style="list-style-type: none"> - Southern Indian River Lagoon and St. Lucie River and Estuary - Caloosahatchee River and Estuary - Southern Charlotte Harbor <p>Southern Everglades</p> <ul style="list-style-type: none"> - Loxahatchee River and Estuary - Lake Worth Lagoon - Estero Bay - Naples Bay - Biscayne Bay - Florida Bay and Florida Keys

CONTENT OF THE 2009 SOUTH FLORIDA ENVIRONMENTAL REPORT – VOLUME I

REPORT OBJECTIVES AND CONTENT

The primary objective of the *2009 South Florida Environmental Report – Volume I* is to summarize annual data and findings relating to the District's programs across the South Florida region – the Kissimmee Basin, Lake Okeechobee, the Everglades, and coastal ecosystems. In addition to building on and updating information from earlier consolidated reports, this year's report also satisfies many reporting requirements of multiple federal and state permits. While continuing to provide efficient communication, this annual report focuses on the past year's major results and findings; more routine and background information from earlier consolidated reports is cross-referenced as appropriate.

The topics of this 13-chapter volume are similar to those in the 2008 SFER. The hydrology of South Florida, the subject of Chapter 2, follows the introduction and provides supporting hydrologic information for subsequent chapters. Water quality status and trends for standard Class III parameters in the Everglades Protection Area (EPA) are presented in Chapters 3A and 3B. Chapter 3B specifically covers water quality issues of special concern apart from phosphorus, currently mercury and sulfur, including an update on research and monitoring in support of risk assessment for mercury in South Florida, the role of sulfur with regard to the mercury risk, and other risks of sulfur contamination. An update on the activities under the phosphorus source control programs implementing regional Best Management Practices (BMPs) and the monitoring results are provided in Chapter 4. Chapter 5 highlights the status of STA compliance, performance, and optimization research. The status of ecological research in the Everglades is provided in Chapter 6. Chapter 7 consists of a two-part update on Everglades restoration including Comprehensive Everglades Restoration Plan (CERP) and Restoration Coordination and Verification (RECOVER) activities. Chapter 7A describes the federal-state partnership to implement CERP and the state initiative to fast-track some initially authorized CERP projects, along with an overview of how these efforts dovetail with other state initiatives across the Northern and Southern Everglades. It also contains appendices with CERP financial information and the progress of CERP implementation in FY2008. Chapter 7B summarizes the ongoing RECOVER activities associated with CERP implementation, including revisions to the Monitoring and Assessment Plan and its integration with the Adaptive Management Program and interim goals and targets. Chapter 8 updates the strategy for achieving long-term water quality goals in the EPA. Chapter 9 summarizes the status of plant and animal invasive exotic species in the South Florida environment.

Similar to previous SFERs, Chapters 10 through 12 provide coverage of Lake Okeechobee, the Kissimmee Basin, and South Florida's coastal ecosystems, respectively. Chapter 10 updates the status of water quality and habitat conditions in Lake Okeechobee and its watershed and lake-related project implementation activities. Chapter 11 summarizes the accomplishments of the Kissimmee River restoration and Upper Kissimmee Basin initiatives, including the design and implementation of the restoration program. Chapter 12 provides an update on the status of the District's estuaries, including reports on freshwater inflows, salinity, water quality, and biological resources. Chapter 12 also highlights the status of the Caloosahatchee and St. Lucie rivers' watersheds, with detailed results from monitoring, research, and modeling projects. Detailed financial information on Everglades restoration during FY2008 is included in Chapter 13.

LEGAL AND REPORTING REQUIREMENTS

The entire *2009 South Florida Environmental Report* is the product of a consolidation process authorized by the Florida legislature in Chapter 2005-36, Laws of Florida, in May 2005. This legislation directs the South Florida Water Management District to consolidate statutorily mandated plans and reports to the Florida legislature and governor, per Subsection 373.036(7), F.S. Other plans and reporting requirements, such as those required in permits, are also addressed in order to improve coordination, efficiency, and effectiveness as part of this consolidation effort. The annual March 1 deadline has been implemented in lieu of statutory deadlines for the submission of certain District plans and reports, including the Everglades Consolidated Report, the Northern Everglades and Estuaries Protection Program Annual Progress Report, and the Comprehensive Everglades Restoration Plan Annual Report.

The District's restoration efforts being implemented under regional programs entail numerous reporting mandates covered in the 2009 SFER – Volume I:

- An Everglades Forever Act Annual Report, required by Section 373.4592, F.S., and Subsection 373.4592(13), F.S., submitted to the FDEP, the Florida governor's office, and the leaders of the Florida legislature. This report must summarize water conditions in the EPA and the status of the impacted areas, STA construction, BMP implementation, and actions taken to monitor and control exotic species.
- An annual peer-reviewed report, required by Subparagraph 373.4592(4)(d)5, F.S., also submitted to the FDEP, the Florida governor, and legislative leaders regarding the research and monitoring program that summarizes all data and findings as an update on most topics included in the 1999 Everglades Interim Report, required by Subparagraph 373.4592(4)(d)5, F.S.
- An annual financial report, required by Sections 373.4592 and 373.45926, F.S., accounting for all monies used to fund the 1994 Everglades Construction Project and the 2003 Long-Term Plan for Achieving Water Quality Goals for EPA Tributary Basins and providing a comparison annually of actual versus projected revenues and a projection of costs and revenues over the most recent, rolling five-year period.
- A non-Everglades Construction Project permit annual report, required by Paragraphs 373.4592(9)(k) and (l), F.S., and by FDEP Permit No. 06, 502590709, to be submitted to the FDEP and to address water quality at structures associated with the EPA that are not included in the Everglades Construction Project. This report also addresses schedules and strategies to improve that water quality.

- A Section 404 Clean Water Act permit report, required by Permit No. 199404532, submitted to the U.S. Army Corps of Engineers (USACE) and addressing the District's strategy for achieving water quality standards and updating the USACE on the activities authorized or otherwise regulated by the permit.
- A series of reports on the STAs required under permits issued under the Clean Water Act and the Everglades Forever Act. These permits require information on the quality of water discharged from the treatment systems and on the progress of the treatment systems at improving water quality.
- A Comprehensive Everglades Restoration Plan Annual Report, required by Section 373.036(7), F.S., and submitted to the FDEP, the Florida governor's office, and the leaders of the Florida legislature. This report provides enhanced oversight and accountability for the financial commitments established under the Everglades restoration section and the progress made in the implementation of CERP, Section 373.470(7), F.S., as amended in 2005.
- A Northern Everglades and Estuaries Protection Program Progress Report, required by Subsection 373.4595(6), F.S., and submitted to the Florida governor's office, and the leaders of the Florida legislature. This report must include a summary of conditions of hydrology, water quality, and aquatic habitat in the Northern Everglades based on the results of the Research and Water Quality Monitoring Programs, the status of the Lake Okeechobee Watershed Construction Project, the status of the Caloosahatchee River Watershed Construction Project, and the status of the St. Lucie River Watershed Construction Project. In addition, the report contains an annual accounting of the expenditure of funds from the Save Our Everglades Trust Fund. At a minimum, the annual report provides detail by program and plan, including specific information concerning the amount and use of funds from federal, state, or local government sources. In detailing the use of these funds, the district shall indicate those designated to meet requirements for matching funds. The report is prepared in cooperation with the other coordinating agencies and affected local governments.
- A Lake Okeechobee Water Control Structure Operations Permit report, required by Permit 0174552-001-GL and issued pursuant to Subsection 373.4595(9), F.S., of the Lake Okeechobee Protection Act and the FDEP's authority under Chapters 373 and 403, F.S. This permit regulates operation and maintenance of and requires water quality information on 34 water control structures that are owned or operated by the SFWMD and that discharge into or from Lake Okeechobee.

STRATEGIC PLAN REPORTING

To maximize the agency’s efficiency and effectiveness, the South Florida Water Management District is committed to a four-part, annual performance management cycle (**Figure 1-3**). As the first step of this cycle, the District’s 10-year Strategic Plan is updated each fiscal year and outlines the agency’s mission, priorities, and success indicators to continually assess progress in each of the 11 programs (see <http://www.sfwmd.gov/>, under *About SFWMD, Budget & Strategic Plan* section).

As presented in Volume II, Chapter 2, the Annual Work Plan Report (also known as the 4th Quarter Report) is central to the “reporting and evaluation” step of the District’s business cycle. In the 2009 SFER, the Annual Work Plan Report serves to evaluate agency compliance with the other elements of the cycle for FY2008, including the District’s Strategic Plan, Annual Work Plan, and Budget. Additionally, the complete 2009 SFER — a key success indicator for the District’s Modeling & Scientific Support (“S”) Program — provides detailed reporting on many of the agency’s strategic objectives, success indicators, and deliverables and milestones across programs. Based on the four areas of the District’s responsibility, an overview of the connections between the agency’s programs and the 2009 SFER is presented in **Table 1-3**.

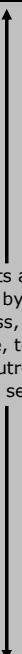


Figure 1-3. The District’s annual performance management cycle.

Table 1-3. Summary of the District’s 11 programs across strategic areas of responsibility and associated chapter coverage in the *2009 South Florida Environmental Report (SFER)*.

	COASTAL WATERSHEDS	COMPREHENSIVE EVERGLADES RESTORATION PLAN	DISTRICT EVERGLADES	KISSIMMEE WATERSHED	LAKE OKEECHOBEE
Chapter Coverage in the 2009 SFER, VOLUME I	Ch. 1, 2, 7A, 7B, 9, 12, 13	Ch. 1, 6, 7A, 7B, 9, 13	Ch. 1-9; 13	Ch 1, 2, 7A, 9, 11	Ch. 1, 2, 7A, 7B, 9, 10, 13
Chapter Coverage in the 2009 SFER, VOLUME II	Ch. 1, 3, 5A, 5B, 6A, 6B	Ch. 1, 2, 4, 6A	Ch. 1, 2, 4, 6A	Ch. 1, 2, 4, 5A, 5B, 6A, 6B	Ch. 1, 2, 4, 5A, 6A
WATER QUALITY	Improve water quality in various water bodies through the development of water quality targets	Protect and improve the quality of water delivered to the greater Everglades system through CERP implementation	Improve water quality delivered to the Everglades through construction and operation of STAs and implementing the Long-Term Plan	Improve downstream water quality through the Kissimmee Upper Bain Restoration Initiative	Improve quality of water entering Lake Okeechobee through development and implementation of regional projects
FLOOD CONTROL	Increase flood protection capability through stormwater projects and partnerships with FEMA	Maintain levels of flood protection	Operate STAs as part of the District's flood control infrastructure	Maintain flood protection capacity through flood mitigation construction	Ensure flood protection levels are maintained in evaluating Lake Okeechobee regulation schedule modifications
NATURAL SYSTEMS	Improve environmental systems through developing and implementing restoration plans	Restore the greater Everglades natural function, including Lake Okeechobee and estuarine systems, through CERP restoration projects	Restore the ecology of the Everglades	Improve Kissimmee River natural function through restoration of Kissimmee Watershed	Improve ecosystem health through water quality improvements, restoration of isolated wetlands, hydrology management, and by controlling exotic species
WATER SUPPLY	Protect water supply sources through developing technical criteria from MFLs and initial water reservations	Increase the available quantity of water and enable resotation of the timing and distribution of water to the greater Everglades ecosystem	Restore more natural flows and levels within the Everglades	Protect water supply sources through developing technical criteria for MFLs and initial water reservations	Maintain current water supplies to southern Florida by making water deliveries to the C&SF Project from Lake Okeechobee

Table 1-3. Continued.

	LAND STEWARDSHIP	MODELING & SCIENTIFIC SUPPORT	OPERATIONS & MAINTENANCE	REGULATION	WATER SUPPLY	MISSION SUPPORT
Chapter Coverage in the 2009 SFER, VOLUME I	Ch. 7A, 11	All	Ch. 2, 5, 6, 7A, 9, 10, 11, 12	Ch. 4, 5, 7A, 10	Ch. 2, 5, 7A, 10, 11, 12	All
Chapter Coverage in the 2009 SFER, VOLUME II	Ch. 1, 2, 4, 6A, 6B, 7	All	Ch. 1, 4, 6B, 7	Ch. 1, 3, 5A, 5B, 7	Ch. 1, 3, 5A, 5B	All
WATER QUALITY	Provide a land base to improve water quality	Collect and analyze data to document changes in water quality, and make information available through electronic and published reports	Ancillary benefits, but not a central focus of this program	Protect water quality through Environmental Resource Permitting and Water Use Permitting processes	Protect water resources through the development and implementation of water supply plans	 <p>Supports all other programs by providing business, human resource, technical, policy, outreach and safety services</p>
FLOOD CONTROL	Provide a land base to restore natural hydrologic conditions	Develop effective flood management strategies by providing computer simulations of flooding events	Provide regional flood protection through appropriate management of the C&SF Project	Provide flood protection level of service through the Environmental Resource Permitting process	Ancillary benefits, but not a central focus of this program	
NATURAL SYSTEMS	Increase functionality of natural systems through habitat restoration, exotic species control, prescribed burning, multiple use practices, and making recreational lands available	Document water quality changes as a means to assess performance of ecosystem restoration efforts, and make information available through electronic and published reports	Protect and enhance natural systems through water deliveries via the C&SF Project and by controlling exotic species	Protect and enhance natural systems through the Environmental Resource Permitting and Water Use Permitting processes	Protect and enhance natural systems by restoring more natural flows and through establishment of MFLs and initial water reservations	
WATER SUPPLY	Ancillary benefits, but not a central focus of this program	Develop water supply strategies by simulating water supply needs and sources through computer modeling	Enhance water supplies to southern Florida by making appropriate water deliveries via the C&SF Project	Provide available water supplies for reasonable-beneficial uses and protect water supply sources through the Water Use Permitting process	Ensure adequate water supplies through the development and implementation of water supply plans	

C&SF Project – Central & Southern Florida Flood Control Project
 CERP – Comprehensive Everglades Restoration Plan
 FEMA – Federal Emergency Management Agency

MFL – Minimum Flow and Level
 SFER – South Florida Environmental Report
 STA – Stormwater Treatment Area

SPECIAL REPORT: UPDATE ON REENGINEERING WATER QUALITY MONITORING IN SOUTH FLORIDA

INTRODUCTION

Water quality is one of the four key areas of responsibility for the South Florida Water Management District and is linked to 10 major programs in the District's Strategic Plan. The water quality monitoring networks in South Florida (**Figure 1-4**) represent a loose confederation of programs initiated under various auspices and time frames, some described in Chapters 2, 3, 4, and 5 of this volume and in earlier consolidated reports. To date, water quality monitoring by the District encompasses about 2,000 stations with 35,000 sampling events and an annual cost of about \$16 million. Over the next decade, as the long-term restoration of South Florida progresses, regional monitoring is projected to increase by at least 30 percent.

To justify and sustain water quality monitoring at this massive scale requires that the District's managers and Governing Board have confidence that the monitoring system has been evaluated and fine-tuned. The system must meet legal, scientific, and management needs efficiently and reflect a balance between information provided to decision makers and public resources invested in the process. Currently, information is derived using data from monitoring networks spanning varying periods of record, taken at differing frequencies at locations determined without due consideration of local, regional, or long-term information. While this "network of networks" may be common in state water quality programs, it is not the most cost-effective or efficient use of resources in dealing with regional or long-term environmental management. Furthermore, the SFER peer-review panel has recommended repeatedly that regional water quality monitoring needs be better integrated, more standardized, and routinely optimized. To address the panel's long-standing concerns and to support water quality as the cornerstone of the District's mission, an integrated monitoring strategy is needed for the entire South Florida region. In the 2008 SFER – Volume I, Chapter 1B documented the development of a newly proposed water quality monitoring strategy for South Florida. An update on the progress of the agency's reengineering efforts is summarized below.

PROGRESS ON REENGINEERING WATER QUALITY MONITORING

Over the past year, the District has made substantial progress in its coordinated efforts in reengineering water quality monitoring across South Florida. Existing optimizations, such as the Permits Optimization Project (JMJV, 2004), have been implemented to the extent possible. Small-scale changes to improve efficiency at individual stations have continued, such as the removal of an auto-sampler from the S-150 structure, termination of routine sampling for some ACME stations, and elimination of several parameters for stations considered in the Permit Optimization Project. A two-year, complete optimization and consolidation of monitoring for Everglades National Park was also approved and implemented in October 2007. These and other small-scale optimizations have provided useful background information to help guide further changes. Notably, it has been determined that monitoring costs are largely associated with staff travel rather than laboratory analyses and quality assurance. Therefore, efforts are being focused on streamlining sampling logistics at structures and reorganizing sampling trips by locale rather than project.

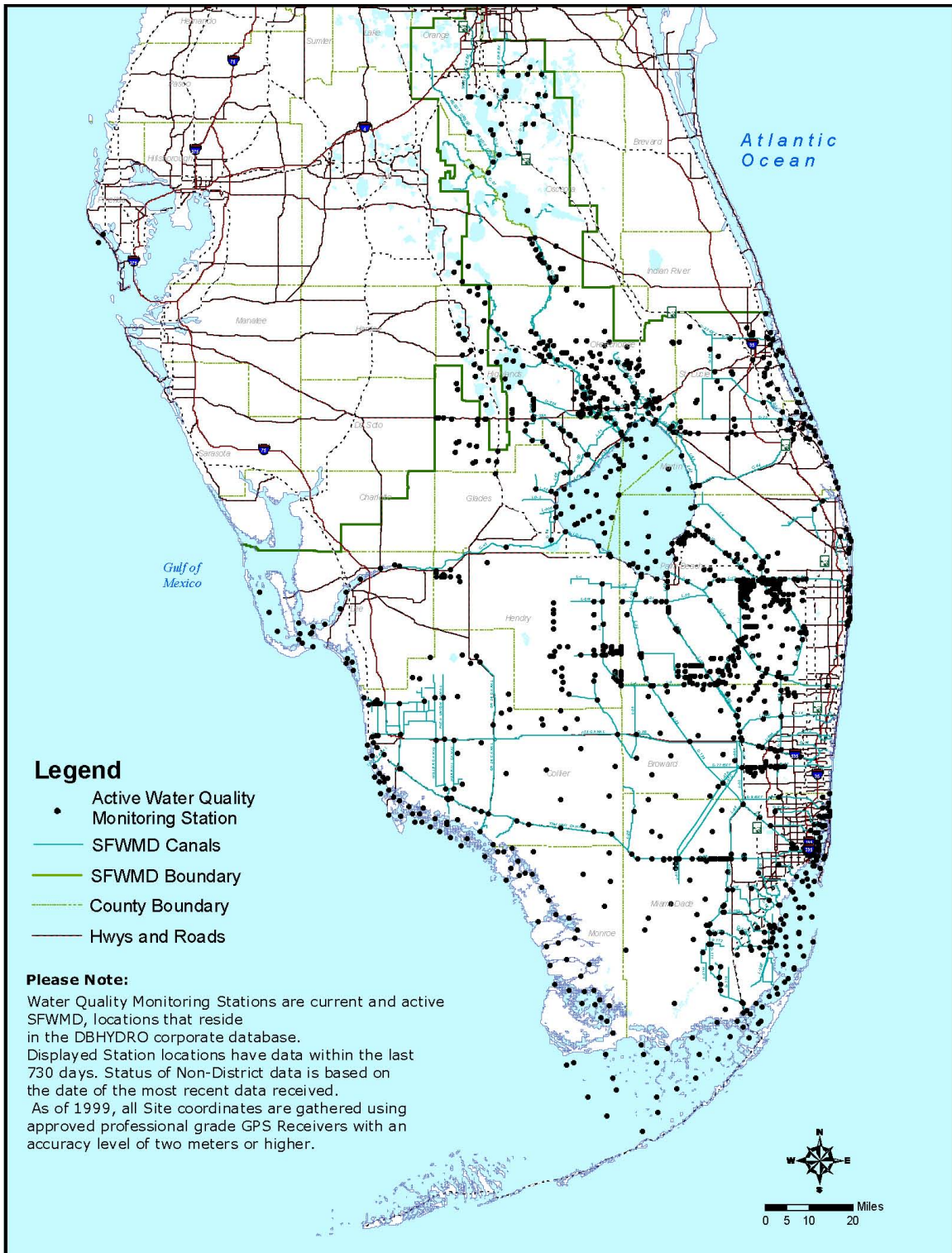


Figure 1-4. Water quality monitoring networks in South Florida.

WCA-2A INTEGRATED MONITORING PROJECT: A PILOT STUDY FOR REENGINEERING MONITORING IN SOUTH FLORIDA

As presented in Appendix 1-4 of the 2004 Everglades Consolidated Report (ECR), the peer-review panel suggested that “While it is recognized that some of the new ECR monitoring efforts are configurations of existing monitoring sites, there do appear to be opportunities, with the planned changes, to carefully evaluate and perhaps, establish a more integrated monitoring efforts, using new concepts and tools being developed as part of the National Water Quality Monitoring Council.” Embracing this concept, the District is now nearing completion of the Water Conservation Area 2A (WCA-2A) Integrated Monitoring Project, a pilot study designed to develop and test concepts to be applied to reengineering of monitoring on a regional scale and provide a basis for changes in monitoring policies and procedures. This project is aimed at evaluating changes in localized monitoring strategies that would still meet regulatory and mission-driven needs while reducing or redirecting resources in an optimal manner.

The pilot study has led to some new approaches and monitoring policies that have great potential for broader use across the District. Based on a novel strategy using real-time flow data to trigger sampling trips, the project predicts nearly a 50 percent reduction in sampling efforts with an approximate annual savings of \$50,000. Presently, agency staff participating in this study has recommended eliminating eight stations and reducing sampling frequency at seven stations in the WCA-2A marsh, resulting in a potential savings of over \$150,000. In an effort to avoid wasteful helicopter trips when the marsh is dry or very shallow, the District has also developed a protocol for suspending sampling during low-water periods to further reduce staff and helicopter time when sampling is not possible or informative. For instance, in 2007 this would have saved over \$20,000 in helicopter time alone for WCA-2A.

Another aspect of the pilot study was a systematic review of WCA-2A monitoring on a structure-by-structure and station-by-station basis, looking at justification for monitoring, possible duplications across programs, and examining redundancies with neighboring stations. These investigations revealed many opportunities to improve efficiencies while satisfying regulatory needs and information for decision making. A draft technical publication detailing all aspects of the pilot study is currently being prepared by District staff. This detailed analysis has produced a suite of proposed recommendations, which includes changing the sampling scheme involving flow at 12 stations, reducing sampling frequency at seven marsh stations, eliminating 10 marsh stations, and adding a station. The net impact of all these changes, once implemented, will be over \$200,000 in cost-savings with a substantial increase in available data.

The pilot study also revealed challenges that will be faced repeatedly as the reengineering proceeds. As projects come and go, monitoring often continues and is sometimes justified for secondary or new uses when the primary uses change. While cooperative data use is laudable, the reengineering must examine whether present day justifications are adequate. During discussions, data users have indicated repeatedly that no changes in monitoring are appropriate because the data might possibly be needed in the future. Such insurance for data gaps based on unknown future needs can be appealing and used to justify almost any monitoring — but most related literature argues that data should be collected for specific objectives (Reid, 2001; Ward et al., 1990; Keith, 1996). Related to these last two points, the “free rider” problem is widespread in monitoring programs. In this common and well-researched phenomenon, individuals benefit from a public resource without participating in its development or funding. Secondary data users can fall into this category, enjoying the use of public data designed and funded by the District without contributing to the process generating the data. Under the reengineering process, the District has avoided using data user surveys because there is little value in enumerating all the ways public

data can be used and others benefiting from related data do not simply justify District funding. While such considerations substantially slow the process, agency staff is confident that these and other challenges can be dealt with effectively as reengineering proceeds.

The reengineering project will continue on several fronts throughout the next year. Efforts to begin implementing recommendations for WCA-2A will begin. An examination of water quality monitoring in Stormwater Treatment Area 2 will be completed under contract and will serve as a pilot study for applying the lessons learned and rethinking the extensive monitoring being conducted in the other STAs and being planned for the new STA Compartment B and C buildouts. Overlapping with this effort, District staff will collaborate with other interested parties to begin a reengineering of monitoring in the Southern Coastal Ecosystems from Biscayne Bay to the Caloosahatchee River.

Draft recommendations for the pilot project, including proposed modified sampling of related structures and marsh stations at WCA-2A, were reviewed at workshops in fall 2008, with integration of stakeholder input. The District is currently preparing technical publications on the WCA-2A pilot project and on the application of auto-samplers, which are both expected to be completed by the end of 2008. Going forward, District staff recognizes that notable challenges lie ahead on many fronts but also envisions opportunities to reconstruct water quality monitoring into a cost-effective and sustainable system that supplies the agency and its partners and regulators with mission-critical data. Ultimately, the agency's goal is to have an integrated regional monitoring system that is collectively designed and adapted around clearly defined needs and supports research, modeling, regulatory compliance, and long-term resource management.

LITERATURE CITED

- JMJV. 2004. Permits Optimization Project. Final Report, April 2004. Prepared by Jacobs/MWH Joint Venture for the South Florida Water Management District, West Palm Beach, FL.
- Keith, L.H., ed. 1996. *Principles of Environmental Sampling*. Second Edition. American Chemical Society. 848 pp.
- Reid, L.M. 2001. The Epidemiology of Monitoring. *Journal of the American Water Resource Association*, 37(4): 815-820.
- Ward, R.C., J.C. Loftis and G.B. McBride. 1990. *Design of Water Quality Monitoring Systems*. John Wiley & Sons, Inc. 231 pp.